Ministerie van Verkeer en Waterstaat

Advanced Dredging Technology

Maintaining soft sea defenses

Hans Otten

10 juli 2006

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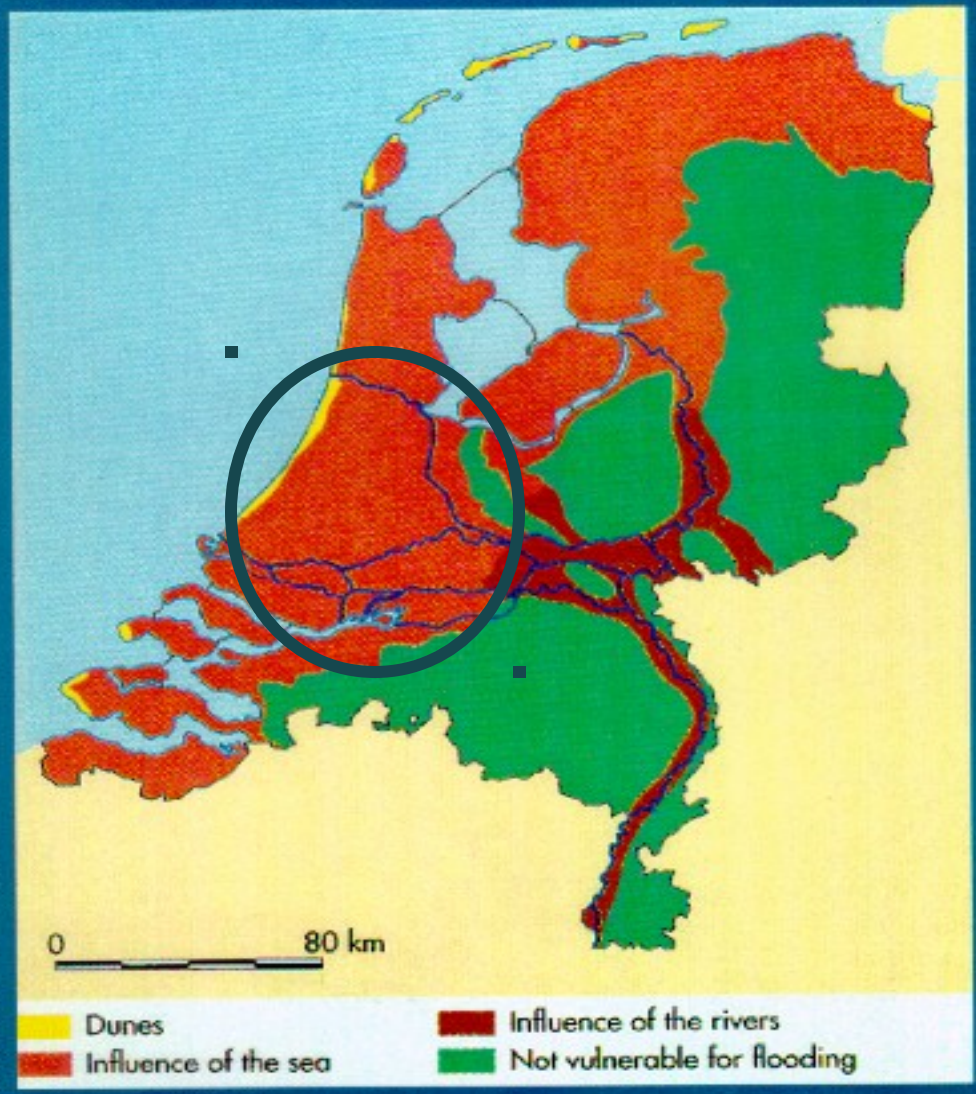
Half of The Netherlands = coastal zone



Heart of Holland
is depending
on dunes
as sea defences

Dunes keep us dry

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Sand stops the sea

If not, we would’t have existed this way

Around 1960 we started to understand why:

A complex relation between

- Maximum wave height
- Water depth
- Sediment grain size
- Gravity

Leads to an equilibrium bottom profile

The equilibrium profile

Used to assess where the coastline will be
in case of design storm

Landward of Base Coastline:
sand nourishment necessary
history of assessments tells how much
within reach of profile

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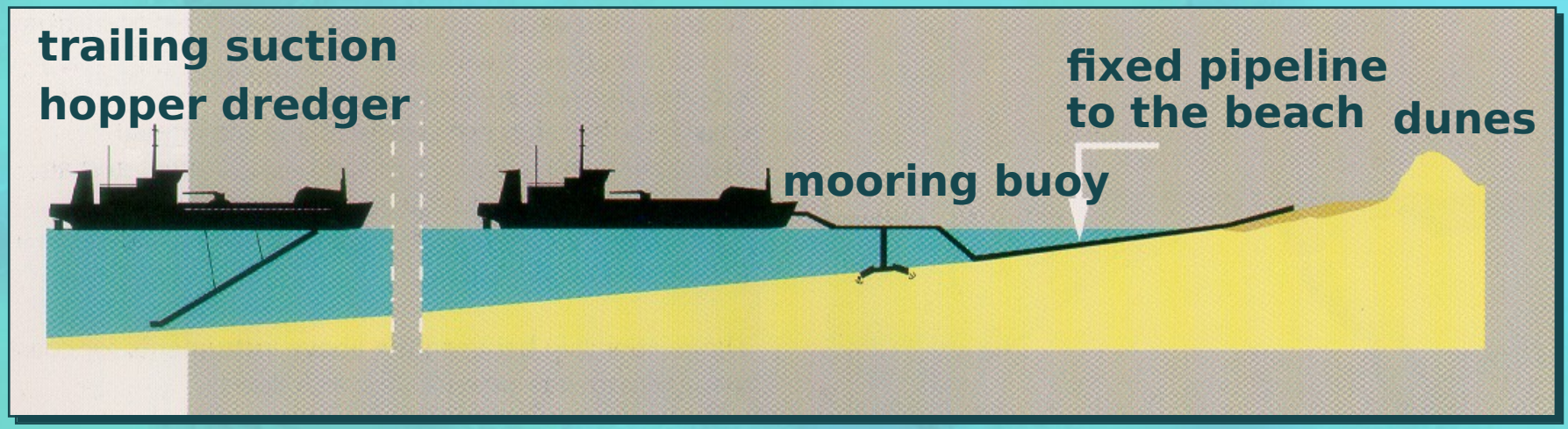
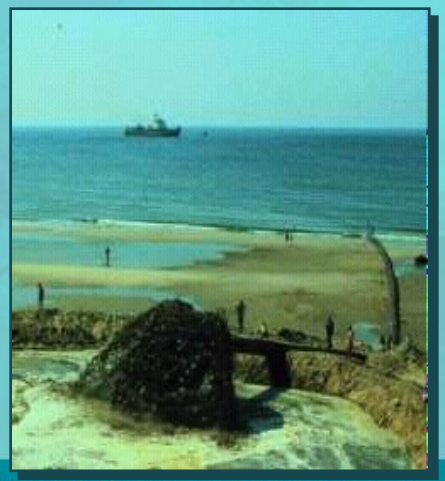
Beach nourishment





Foreshore nourishment

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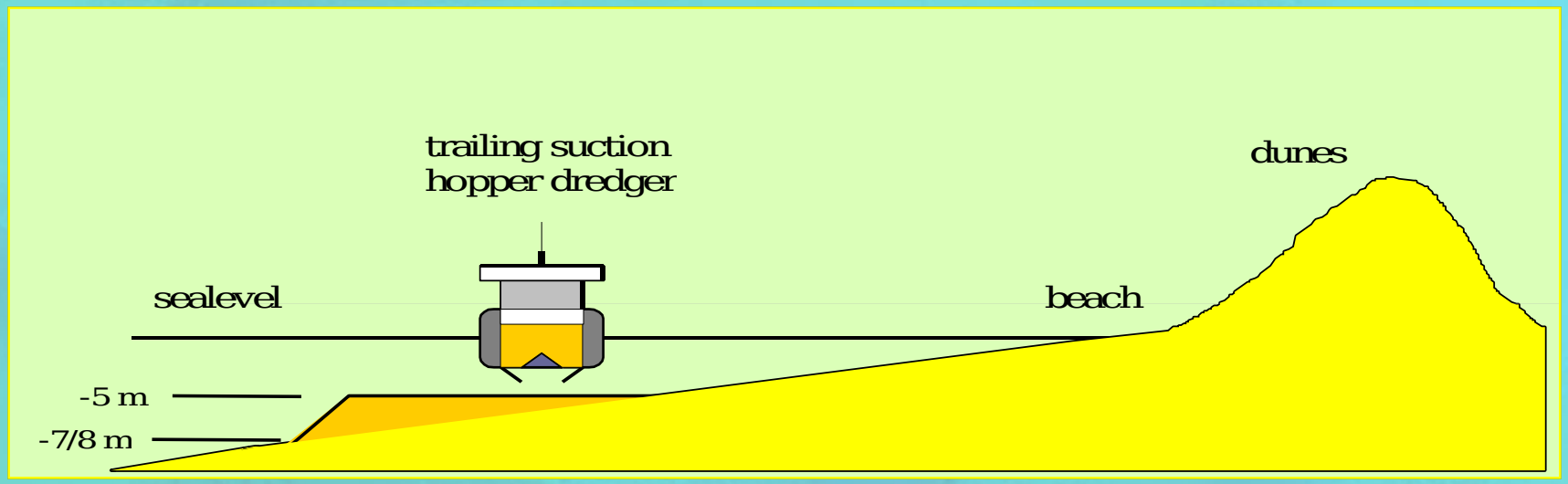

Behaviour foreshore nourishment

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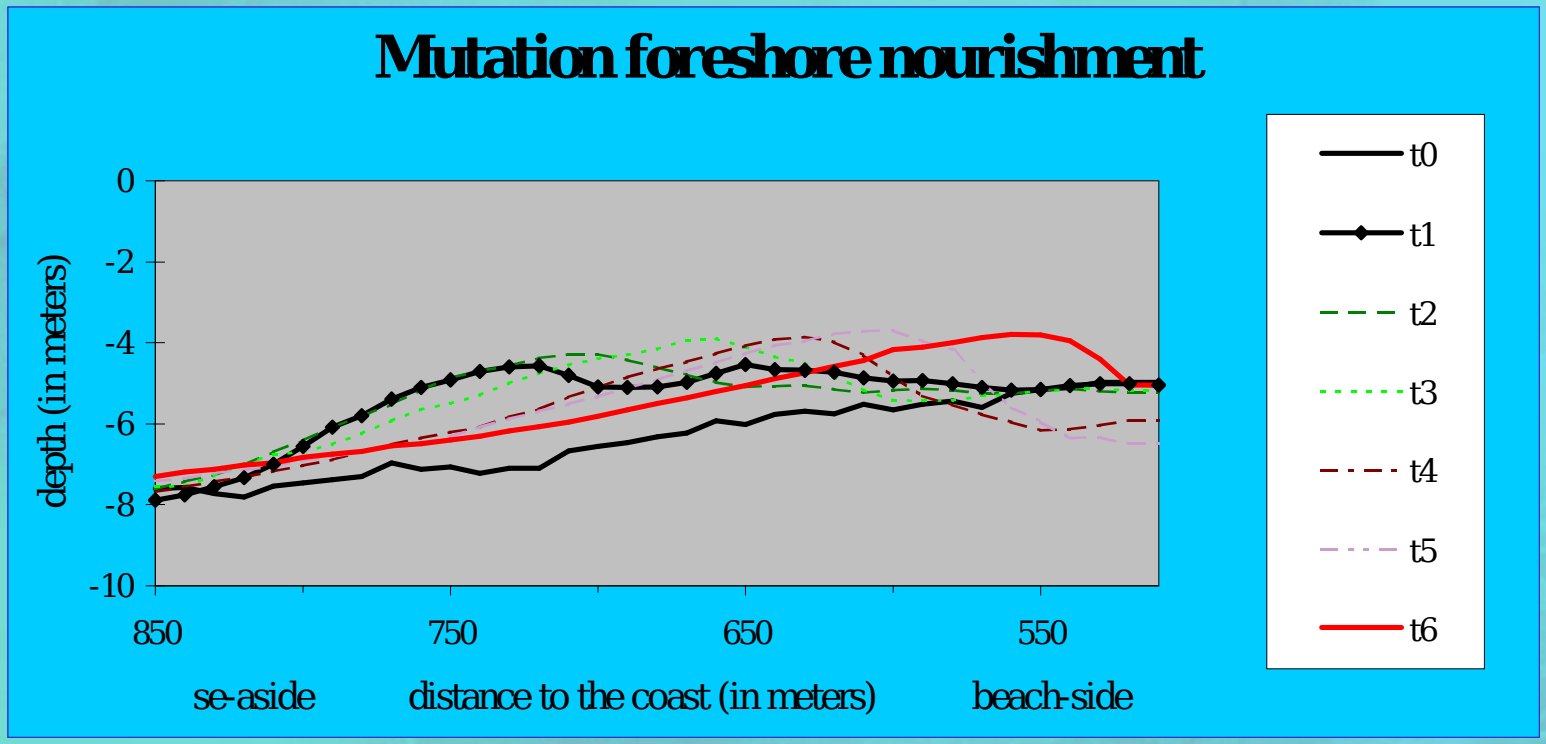

Sand volume in erosive areas

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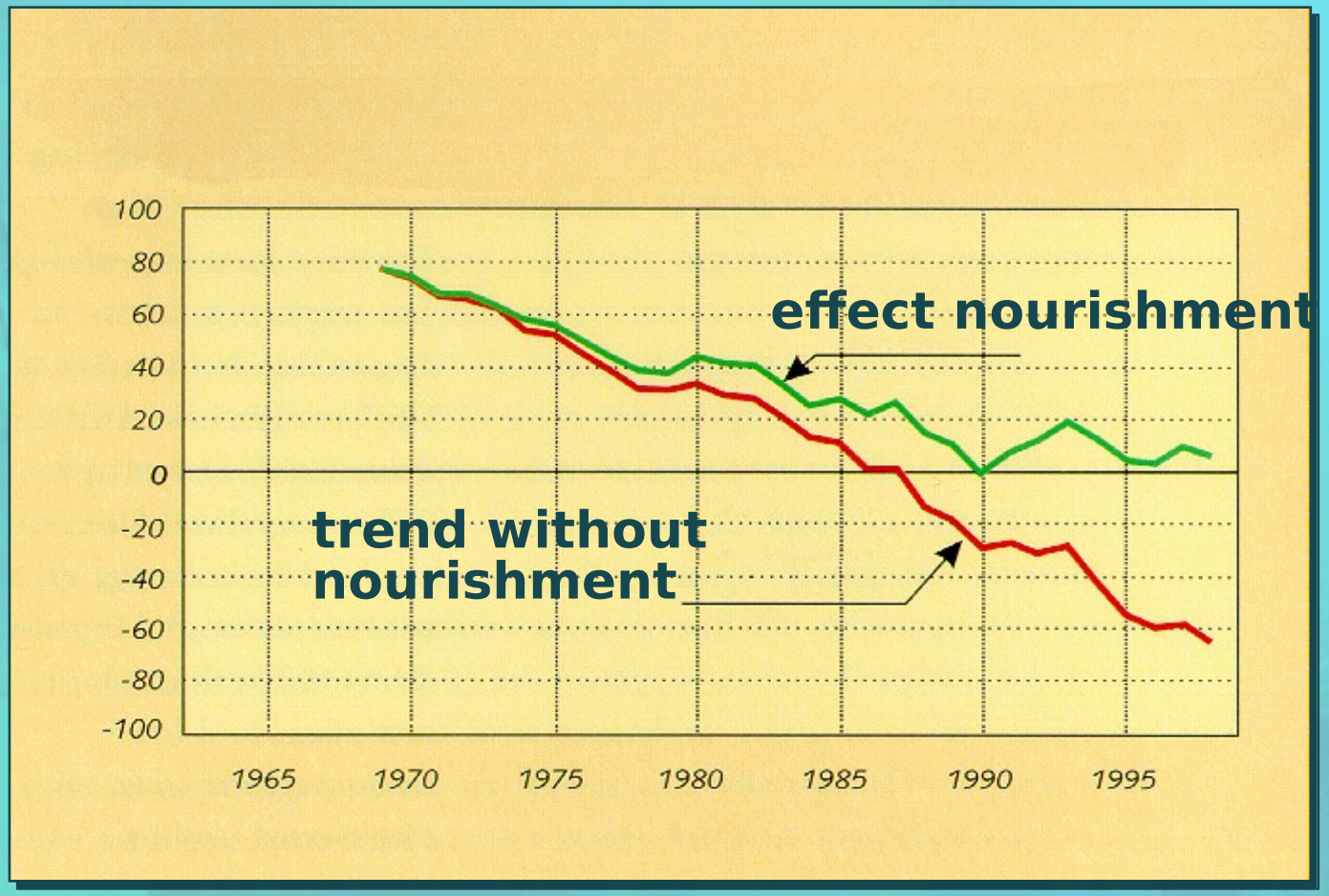

History of nourishment

1970 - 1990: 1,5 Mm^3 / year

1991 - 2000: 6 Mm^3 / year

2001 - 2006: 10 Mm^3 / year

Foreshore nourishment:
Gradually increasing

Future nourishment volumes

Effect of Seawater level rise:

- 20 cm/century: 12 – 16 Mm^3/year
- 60 cm/century: 19 – 31 Mm^3/year
- 85 cm/century: 23 – 38 Mm^3/year

USArmy Corps of Engineers

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